

**PRODUCTION OF MEDIUM CHAIN LENGTH  
POLYHYDROXYALKANOATES FROM FATTY ACID  
BIOSYNTHETIC PATHWAYS**

**Abstract of the Invention**

Methods for producing polyhydroxyalkanoates (PHAs) from fatty acid biosynthetic pathways using a 3-hydroxy acyl ACP thioesterase, a PHA synthase, and an acyl CoA synthetase, have been developed. Methodology for enabling PHA production from fatty acid biosynthetic pathways in non-native bacterial PHA producers and plants using an enzyme having the catalytic activity of 3-hydroxy acyl ACP thioesterase, an acyl CoA synthetase with substrate specificity for medium chain length 3-hydroxy fatty acids, and a medium chain length PHA synthase, has been developed. Acyl CoA synthetase activity can be supplied either by the endogenous acyl CoA synthetase of the host organism, when sufficiently expressed, or the host organism's activity can be supplemented by the expression of a recombinant acyl CoA synthetase gene. New strategies are described for plant based PHA production in the chloroplasts, cytosol, and peroxisomes of biomass crops as well as the plastids, cytosol, and peroxisomes of oil seed crops.